

# Emissions Program Update

Presented to: REDAC Environment & Energy  
Subcommittee

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Federal Aviation  
Administration



# Primary Emissions Activities

- **Develop Emissions Research Roadmap**
- **Recent Accomplishments**
- **Longer-Term Research Needs**

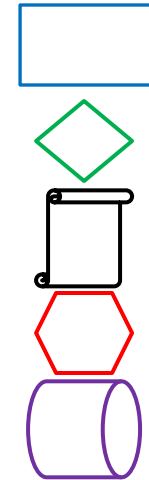


# Roadmap Guidelines: FAA Emissions Goals

- **Air Quality**
  - Achieve an absolute reduction of significant air quality health and welfare impacts attributable to aviation, notwithstanding aviation growth.
- **Climate**
  - Limit the impact of aircraft CO<sub>2</sub> emissions on the global climate by achieving carbon neutral growth by 2020 compared to 2005, and net reduction of the climate impact from all aviation emissions over the longer term (by 2050).

# Emissions Research Roadmap Process

1. Identify Primary Elements
2. Recognize Current Capabilities
  - Processes
  - Outcomes
  - Documentation
  - Tools
  - Databases
3. Establish Connections
  - Enablers vs. Final Outcomes
4. Define Gaps
  - Assess time and resources to address



# Primary Elements of FAA's Emissions Research Roadmap

ROAD  
MAPPING

Certification  
and  
Regulations

Emissions  
Tools  
Development

Emissions  
Source  
Characterization

Climate  
Impacts  
Research

Aviation  
Emissions  
Modeling

Guidance

Health  
Impacts  
Research





# Emissions Research Roadmap

ROAD  
MAPPING

- **Next Steps**

- Provide future estimates
  - Funding
  - Timeline
  - Resources
- Identify connections to other Research Roadmaps
  - Noise
  - Alt Fuels
  - Operations
  - Tools



# Recent Accomplishments: PM Emission Measurements

- **SAE Aerospace Recommend Practice**
  - Final draft in progress
  - Balloting in early 2015
- **nvPM Measurement Campaigns**
  - Honeywell in July (DONE!)
  - GE in September (2 different engines)
  - Rolls Royce Indianapolis in October
- **Corrections criteria are being developed**





# Recent Accomplishments: Guidance

- **SAE Aerospace Recommend Practice for nvPM Emissions Measurements**
  - Final draft in progress
  - Balloting in early 2015
- **Advisory Circular 34 update**
  - CAEP/8 NOx certification
  - Fuel venting guidance
  - Harmonize with ICAO Annex 16 vII and the Environmental Technical Manual updates



# Recent Accomplishments: Certification & Regulations

- **Aircraft CO2 Emissions Standard**
  - Finalized technology responses
  - Certification procedures for new types and in-production aircraft
- **Engine nvPM Emissions Standard**
  - Proposed PM mass concentration transition standard in Feb2016 based on existing max Smoke Number
    - Mandatory reporting requirement for all engines by 2020
  - Proposed stringency for both nvPM mass and number in Feb 2019
    - Eliminate Smoke Number standard after 2020



# Recent Accomplishments: Emissions Tools Development

- **APMT-I Air Quality – USA**
  - NAS-wide modeling based on Community Multi-scale Air Quality Model (CMAQ)
  - Scalable for single airport to 48 lower States
  - Advanced chemistry + weather + physical
  - Currently being tested and validated
- **APMT-I Air Quality – Global**
  - GEOS-Chem Adjoint model development
  - Fast-time model with a US-nested high fidelity grid
  - Will be tested as part of ICAO/CAEP standards



# Recent Accomplishments: Emissions Tools Development

- **APMT-I Climate regional tools**
  - Integrated Global System Model (IGSM)
    - Used to compare the environmental impact due to different aviation growth rates
    - Evaluate the interaction with varying background emission levels as a result of fluctuations in other sectors
    - Can distinguish the impacts of geospatial differences in emissions
    - Assess zonal climate response and impacts
  - CICERO Zonal Climate Model
    - Based on regional temperature changes



# Recent Accomplishments: Climate Research

- **What are non-CO2 aviation climate effects in 2050?**
  - Business as usual “no change”
  - New technology + operations
  - ...and alternative fuels
- **Surface AQ impacts from cruise emissions**
  - 6 different global modeling teams
  - Determine global health impacts



# Recent Accomplishments: Health Impacts

Health  
Impacts  
Research

Aviation  
Emissions  
Modeling

- **Lower 48 Analysis**
  - Exposure criteria
  - Airport centric using APMT-I AQ – USA
  - Hourly time resolution to capture aviation activity and pollutant variability
  - Working on incorporating advanced weather into modeling aviation activities
    - Match the advanced weather in impacts model



# New ASCENT COE Projects

- **Particulate Matter Emission Measurements**
  - Measure more engines across North America!
- **Air Quality Research**
  - Impacts modeling – domestic & global
- **Climate Research**
  - Microphysical modeling of NASA's ACCESS II data
  - Develop 2012 Contrail Observational Data Set
  - Regional Climate Tool Development
- **Alt Fuels Emissions Data Set**
  - Central database of alternative fuels emissions tests



# Longer Term Research Needs

- **Predictive contrail formation and/or contrail avoidance capabilities**
- **Advanced sustainable fuels and combustion technology optimized for low/no pollutant formation**
- **Real time up-link air quality and emissions statistics to the cockpit during rerouting**
- **Provide air traffic controllers with daily emissions and fuel burn information**

